

CLAIMS

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

- 1 1. A process for using a reaction sequence to deposit layers on a substrate,
2 the process comprising:
 - 3 a) placing the substrate in a chamber;
 - 4 b) heating the chamber;
 - 5 c) forming a first layer of a first gaseous precursor moiety molecules upon the
6 substrate;
 - 7 d) exposing the substrate and first layer to gaseous molecules of a second
8 moiety at a concentration and for a time sufficient for the molecules of the second
9 moiety to be absorbed to the first layer; and
 - 10 e) allowing the first moiety to react with the second moiety so as to form a
11 monolayer of product moiety molecules.
- 1 2. The process as recited in claim 1 wherein the process occurs at
2 temperatures ranging from about 200°C to 400°C.
- 1 3. The process as recited in claim 1 wherein the steps c through e are
2 repeated.

- 1 4. The process as recited in claim 1 wherein steps c, d, and e are self-
2 limiting.
- 1 5. The process as recited in claim 1 wherein the process is continuous.
- 1 6. The process as recited in claim 1 wherein more than three precursor
2 moieties can be applied to the substrate's surface.
- 1 7. The process as recited in claim 1 wherein the carrier gas is selected from
2 the group consisting of nitrogen, argon, and helium.
- 1 8. The process as recited in claim 1 wherein layers of product moiety are
2 deposited as a film.
- 1 9. The process as recited in claim 8 wherein the film growth rate is up to
2 about one micron (μ) per hour.
- 1 10. The process as recited in claim 1 wherein layers required for HTS
2 superconductor materials can be deposited without removing the substrate from the
3 process chamber.
- 1 11. The process as recited in claim 1 wherein inert carrier gas facilitates
2 transport of the gaseous moieties into and out of the chamber.
- 1 12. The process as recited in claim 10 wherein layers of mixed yttrium
2 oxides, barium oxides, copper oxides and calcium oxides are deposited onto the
3 substrate to fabricate HTS superconductors.
- 1 13. The process as recited in claim 1 wherein each of the moieties are

2 supplied to the chamber as a pulse of pure gas.

1 14. The process as recited in claim 13 wherein the pulse has a duration of
2 between one tenth of a second and one second.

1 15. The process as recited in claim 13 wherein a pulse of inert gas is provided
2 between each pulse of pure gas.

1 16. A device to facilitate conformal deposition of atomic layers upon
2 substrates, the device comprising:

- 3 a) a reaction chamber;
- 4 b) a means for injecting fluid into the reaction chamber at pulsed intervals;
- 5 c) a means for removing the pulsed fluid from the reaction chamber; and
- 6 d) a means for regulating the atmosphere and temperature of the chamber.

1 17. The device as recited in claim 13 wherein the injecting means comprise
2 valves for regulating the release of different precursor reactant moieties and inert carrier
3 gas.

1 18. The device as recited in claim 13 wherein the atmosphere regulating means
2 comprise vacuums to create negative pressure and effect gas flow through the device.

1 19. The device as recited in claim 13 wherein the atmosphere regulating means
2 is capable of maintaining precursor reactant moieties in the vapor state.

1 20. The device as recited in claim 13 wherein the computerized gas pulse
2 switch comprises a programmed computer and a pneumatic valve.